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ABSTRACT

Compared were long-term achievement gains made by first, second, and third grade students who attended either a public school kindergarten, nonpublic school kindergartens, or no kindergarten prior to first grade in northeastern Mississippi. Also investigated were relationships of race and sex to academic achievement. Dependent variables included all subtest and total scores on the California Achievement Tests, which were administered as part of the school's normal testing policy to students entering the first grade and students in the primary grades. Subjects were 136 students enrolled in the first grade during the 1981-1983 school years who remained in the school system for four consecutive years from kindergarten through third grade; 134 students with no kindergarten experience; and 185 who attended nonpublic kindergarten. Findings indicated that students who attended kindergarten, public and nonpublic, performed at higher levels of achievement in the first three elementary grades than did students who did not attend kindergarten. These differences were significant throughout the grade levels. (RH)

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A LONGITUDINAL STUDY OF ACHIEVEMENT ASSOCIATED WITH PARTICIPATION IN A PUBLIC SCHOOL KINDERGARTEN

By

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ABSTRACT

The purpose of this study was to compare long term gains made in achievement in the first, second, and third grades by children who attended a public school kindergarten to gains made by children who attended nonpublic school kindergartens or no kindergarten prior to first grade entrance. The study also sought to determine whether or not the variables of sex and race were related to academic achievement. Dependent variables included all subtests and total scores produced by the California Achievement Test.

The subjects for this study consisted of all students enrolled in the first grade during the 1981-1983 school years and who remained in this school system for four consecutive years beginning with the kindergarten year through the third grade. The sample included 134 students who had no kindergarten experience, 185 students who attended nonpublic school kindergarten, and 136 students who attended public school kindergarten.

Results of the MANOVA analyses indicated that the preschool effect was the only variable which yielded significant findings. The sex effect yielded no systematic significant differences between the sexes. The race effect was eliminated from all analyses because it was found to be highly intercorrelated with the preschool effect. The students who attended kindergarten, public and nonpublic, performed at higher levels of achievement in the elementary grades one through three than the students who did not attend kindergarten. These differences were significant across grade levels.

Significance of the Problem

Much has been written on the importance and effects of kindergarten since Frederick Froebel established the first kindergarten in Germany in 1837 (Ransbury, 1982). Many studies have reported that kindergarten does have long-term educational benefits (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, & York, 1966; Lazar & Darlington, 1979; Mayeske, Cohen, Wesler, Okada, Beatin, Proshek, Weinfeld, & Tabler, 1979). Lazar and Darlington (1979) reported the findings of the Consortium of Longitudinal Studies regarding the effectiveness of Head Start and similar preschool programs. Twelve investigators pooled their data from studies conducted during the 1960s and designed a common follow-up study to analyze the effect of preschool experience on later achievement. They reported that early education programs significantly reduced the number of children assigned to special education and the number of children retained in a grade. The studies primarily focused on low income children in large cities, many of whom had attended preschool since the ages of two and three.

Schweinhart and Weikart (1980) collected data for more than 17 years in a longitudinal study of children who participated in the Perry Preschool Project in Ypsilanti, Michigan. This project was designed to determine whether preschool experience benefits disadvantaged children. Weikart found that in the early grades,

differences in achievement between experimental and control groups in reading, language, and mathematics on the California Achievement Test were slight, but these differences increased over time. By the end of the eighth grade, the experimental group tested the equivalent of more than one full grade higher than the control group. While these results are significant and have been cited by many early childhood supporters, it should be noted that the sample consisted only of children whose IQ scores were 85 or lower.

Just as there are numerous studies in which the results indicated that kindergarten made a difference, there are many that questioned the value of this aspect of education. The Westinghouse Report in 1969 received national attention when it asserted that there were no lasting effects from the Head Start experience. In 1971, the fade-out hypothesis was proposed which stated that there were early gains in school performance attributable to Head Start, but that they tended to fade out in later years (Brown, 1978). Brown reported that the Head Start children improved in performance on cognitive measures but still remained below the national middle class test norms for their ages. Another study conducted over a six-year period in Wilcox County, Alabama, found that no significant gains in later academic achievement existed for children who had participated in a Title I kindergarten program (Thompson, 1980).

Fewer longitudinal studies that focused on public school kindergartens can be found. Abram (1980-81) conducted a study in the McLean County Public Schools in Kentucky. Third through sixth graders who had attended kindergarten scored higher in academic aptitude at all four grade levels tested than did students who had not attended kindergarten. These differences were significant at grades three, four, and six.

Another longitudinal study was conducted in the state of Tennessee by Woodruff (1980). The Tennessee Basic Skills Test was administered to 64,000 eighth graders. The study found that achievement scores for pupils with kindergarten backgrounds were superior to those of nonkindergarten pupils in mathematics, spelling, language, and reading.

As evidenced in the preceding pages, a plentiful supply of studies that support or dispute the positive impact of kindergarten is available to researchers and educators. However, the literature concentrates primarily on the performance of low ability or low socioeconomic students (McLean & Nelson, 1982). There is a lack of studies that focuses on longitudinal achievement gains of children who attended public school kindergartens.

Need for the Study

Until the Education Reform Act of 1982, Mississippi was the only state in the United States that did not operate public school kindergartens. In 1978, Mississippi enacted legislation which

permitted local school districts to establish kindergarten programs if they could find money other than state dollars to fund them. The Reform Act of 1982 provided that each local school district must implement a kindergarten program during the 1986-87 school year. However, the authorizing legislation for kindergartens will be automatically repealed on July 1, 1990. At this time, if public school kindergarten is to continue, the State Constitution must be amended to provide for it (Early Childhood Education Grant-in-Aid Program, 1985).

In an article entitled "The Kindergarten Concept: A Necessary Component of the Educational System" (1980), Blackwell reported that many contemporary educators recognize kindergarten as part of the continuum which represents the process of learning. Blackwell wrote that there is a growing awareness among government, scholars, and business that kindergarten programs for children must move from the bottom of the education agenda to a high priority position. Even though the Reform Act of 1982 provided for public kindergarten from 1985-1990, research data that will be gathered from across the state for the next five years will influence the future of kindergartens after 1990. A look at one public school kindergarten program in existence since 1979 will provide longitudinal data about the relationship between public school kindergarten and future progress in the elementary grades. This information can be used to guide educational leaders in

Mississippi in making decisions over the next five years about kindergarten evaluation and curriculum.

Statement of the Problem

The purpose of this study was to compare long term gains made in achievement by children who attended a public school kindergarten to gains made by children who attended nonpublic school kindergarten and gains made by children with no kindergarten prior to first grade entrance. The study also sought to determine whether or not the variables of sex and race were related to academic achievement.

Research Design

The design for this study was longitudinal and, by necessity, a correlative ex post facto design. Dependent variables included all of the subtests and total scores produced on the California Achievement Test: Form 10, Level C; Form 11, Level C; Form 12, Level C; and Form 13, Level C. Total reading and total math scores from Form 10, Level C were used as a base line assessment of achievement prior to first grade. Scores available from Form 11, Level C included phonetic analysis, reading vocabulary, comprehension, total reading, language expression, computation, mathematics concept and application, total mathematics, and total battery. Scores available from Form 12, Level C and Form 13, Level C included phonetic analysis, structural analysis, reading

vocabulary, comprehension, total reading, spelling, mechanics, language expression, total language, computation, mathematics concept and application, total mathematics, and total battery.

Independent variables for this study were race, sex, and type of kindergarten attended. The subjects were placed into three groups based on type of kindergarten attendance which included no kindergarten experience prior to first grade, public school kindergarten, and nonpublic school kindergarten. These three groups were examined to determine if there were differences between the public school kindergarten and nonpublic school kindergartens as well as to discern the impact of kindergarten experience on achievement through the third grade. That is, were the children who had had kindergarten experience achieving at the same or different level and rates at each of the grade levels as the children with no kindergarten experience?

Race and sex were initially used as control variables. In subsequent analyses, race was removed as a variable because of its high intercorrelation with the primary variable of interest, the type of kindergarten experience. Sex was included as an independent variable to examine academic success in different subject areas.

A time-series model was used for the data collection. Following the notation of Campbell and Stanley (1963), this design

can be graphically displayed as:

X 0 0 0 0

X 0 0 0 0

X 0 0 0 0

The X = participation in no kindergarten prior to attending first grade.

The X = participation in a public school kindergarten.

The X = participation in a nonpublic kindergarten.

The 0 = the measure of achievement prior to beginning first grade.

The 0 = the measure of achievement at the conclusion of first grade.

The 0 = the measure of achievement at the conclusion of second grade.

The 0 = the measure of achievement at the conclusion of third grade.

Population and Sample

The population for this study consisted of all students enrolled in the first grade during the 1981-1983 school years. Of this population, the sample was limited to those students who remained in this school system for four consecutive years beginning with the kindergarten year through the third grade (see Table 1). The sample included 134 students in the group who had no kindergarten background, 185 students who attended nonpublic

Table 1

Subjects

	No Kindergarten				Nonpublic Kindergarten				Public Kindergarten			
	1983	1982	1981	Total	1983	1982	1981	Total	1983	1982	1981	Total
White Males	4	7	3	14	16	15	19	50	20	15	10	45
Black Males	13	19	16	48	18	16	14	48	4	8	10	22
White Females	5	4	8	17	12	10	18	40	16	18	12	46
Black Females	23	17	15	55	23	7	17	47	9	9	5	23
Total	45	47	42	134	69	48	68	185	49	50	37	136

1981, 1982, and 1983 refer to the year in which that group began first grade.

school kindergarten, and 136 students who attended public school kindergarten. All of the students from this university town in northeast Mississippi were six years old on or before September 1 of their first grade year.

Instrumentation

As part of this school's normal testing policy, all children who entered the first grade were administered the California Achievement Test (CAT), Form C, Level 10. The CAT was given each summer, during June, by three psychometrists on two consecutive days. Testing conditions were kept constant across testing rooms and testing days. During the course of this research, the CAT was administered in April to every elementary student in the public school system as part of the state-wide testing program. Form 11, Level C was administered to the first grade students; Form 12, Level C was administered to the second grade students; and, Form 13, Level C was administered to the third grade students. The California Achievement Tests were selected to be used as measures of achievement because these scores were the only data available on the entire sample that could be used to make comparisons among the three groups in this study. Classroom teachers administered this achievement battery to their own classes. The teachers were given instructions on instrumentation procedures by the school psychometrist.

Statistics

Two methodologies could have been used with this data. First, the data might have fit a univariate ANOVA type model with gain scores considered as the dependent measures. However, growth scores have demonstrated significantly lower reliability than simple observed scores (Stanley, 1971).

Second, a repeated measures design could have been used, but such a design required quite restrictive assumptions about the nature of subject responses to the intercorrelations of scores obtained under each treatment. Specifically, it must be assumed that all treatment groups demonstrate equal within group variances. Additionally, the rate of growth must be identical across the years, and, therefore, must have no cumulative effects. When these assumptions are not met, the significance tests can, at best, be considered approximate (Harris, 1975). Multivariate methods do not make assumptions as to the nature of the intercorrelations obtained under each treatment and thus provided exact tests of the hypotheses in this study. Thus, MANOVA, a special case of canonical correlation, was used in the analysis procedure for this research (Thompson, 1984).

Multivariate analysis, in this study, examined the relationship between the two sets of data, the independent variables and the dependent variables, and determined to what extent one set of two or more variables could be predicted by

another set.

Independent Variables	Dependent Variables
1. Race	1. Considered each years' achievement scores as separate variables.
2. Sex	
3. Type of Kindergarten Experience	

Step one identified the components of one set of the variables that were most highly related to the components of the other set of variables. Thus, two composites were formed. Composite scores were derived to maximize the relationship between the two variable sets by weighting each person's data and summing the weighted scores in each set. From this point on, the analysis proceeded into traditional univariate methods: one-way, two-way, and three-way ANOVA (Harris, 1975).

The analysis focused on several dependent outcomes and was repeated separately for each subscale score provided by the CAT. The first question addressed was, is there a difference in the rate of growth in the three kindergarten conditions? Second, is there a difference in the overall achievement level attributable to the three kindergarten conditions (Thompson, 1984)?

The data were analyzed in two ways, combining all three waves of students into one total group and on a yearly basis. Since the proportions were the same in sex, race, and type of kindergarten attendance from year to year, it was reasonable to put all of the

subjects together, which increased the N and, thus, increased the power.

Analyses were limited to the availability of complete data. A maximum of four measures for two subscales was available, and a minimum of three and two measures was available in the other subscales.

Assumptions

The following assumptions were made in conducting this study:

1. The subjects who attended the public school kindergarten were typical of all students in the school system who were of the kindergarten age during the years 1980-1982.
2. The experimental mortality rate had no effect on the characteristics of the post-experimental groups; therefore, the subjects in the study were typical of the original population.

Limitations

The following limitations existed for this study:

1. Variables such as home backgrounds could not be controlled in any of the groups.
2. Instructional delivery in grades one through three could not be controlled in any of the groups.
3. Cognitive measures were the only variables used to assess the impact of kindergarten.

4. Because of the ex post facto design, random assignment into groups could not be used.
5. Instructional delivery in nonpublic kindergarten classrooms could not be controlled.

Definition of Terms

The following operational definitions were used in this study:

1. Kindergarten: Any planned program in which a child is enrolled during the year prior to entering first grade is considered to be a kindergarten program if the program meets five days per week for a minimum of three hours per day.
2. Public kindergarten: A kindergarten which operates as part of the public school system and is free of charge to all children of the appropriate age regardless of race, socioeconomic status, or sex.
3. Nonpublic kindergarten: A kindergarten that charges a fee for attendance or is operated by a specific organization for a select group of children.
4. No kindergarten: No public or nonpublic kindergarten experience prior to first grade.
5. Achievement: The scores made on the California Achievement Test at the end of each of the first three grades. Achievement is defined by all subtest and total scores of the reading, language, and math sections.

Conclusions

One outstanding finding in this study, which was consistent with past research (Cowles & Daniels, 1978; Lazar & Darlington, 1979; Schweinhart & Weikart, 1980; Woodruff, 1980), was that the students who attended kindergarten performed at higher levels of achievement in the elementary grades one through three than the students who did not attend kindergarten. The public school kindergarten group scored significantly higher than the no kindergarten group on 92% of the subtests offered on the California Achievement Test. Both the public school kindergarten and the nonpublic school kindergarten groups scored significantly higher than the no kindergarten group on 81% of the subtests. Therefore, the implication may be drawn that kindergarten attendance, even of various types, can make an impact on later school success (Weikart, Epstein, Schweinhart, & Bond, 1978). This theory has been documented numerous times across the nation (Abram, 1980-81; Lazar & Darlington, 1979; McLean & Nelson, 1982) and now is documented in Mississippi utilizing public school heterogeneous groups of children (Table 2).

Another interesting finding in this study was that, even though not statistically significant, the public school kindergarten group out-performed the nonpublic kindergarten group on the majority of subtests across the majority of grade levels. These differences ranged from 2 to 24 scale score points (Tables 2

Table 2

Significance Table

	Oneway Preschool Only Total Groups			
	Kind.	Grade 1	Grade 2	Grade 3
Phonetic Analysis	999	1 3 2*	1 3 2*	1 3 2
Structural Analysis	999	999	1 2 3*	1 3 2*
Reading Vocabulary	999	1 3 2*	1 3 2*	1 3 2*
Comprehension	999	1 3 2*	1 2 3*	1 3 2*
Total Reading	1 3 2*	1 3 2*	1 3 2*	1 3 2*
Spelling	999	999	1 3 2*	1 3 2*
Mechanics	999	999	1 3 2	1 3 2*
Language Expression	999	1 3 2*	1 2 3*	1 3 2*
Total Language	999	999	1 3 2*	1 3 2*
Computation	999	1 3 2*	1 3 2*	1 2 3
Mathematics Concept and Application	999	1 3 2*	1 3 2*	1 3 2*
Total Mathematics	1 3 2*	1 3 2*	1 3 2*	1 3 2*
Total Battery	999	1 3 2*	1 3 2*	1 3 2*

* Significant results found
999 No score available
Underscored pairs were not significantly different

Group 1 - No Kindergarten
Group 2 - Public Kindergarten
Group 3 - Nonpublic Kindergarten

and 3).

One hypothesis which could account for the differences in mean scores between the public school and nonpublic school kindergartens could be the type of program offered. This public school kindergarten (Correro, 1986), founded on a philosophy based on research and pedagogy, is similar to the High/Scope model reported by Weikart to be the most effective kindergarten program (Hechinger, 1986). The students are encouraged to experiment with physical and social forces, to acquire new methods for expressing feelings and understandings, and to acquire new information through inquiry, experimentation, observation, listening, and reading. The students are challenged in ways appropriate for five-year-olds, their needs are met, and they are encouraged to actively participate in the classroom environment (Blackwell, 1980).

In addition, this public school kindergarten provides a program which encompasses goals of educating the whole child. Physical, emotional, social, and intellectual development are all intergrated into the curriculum. Activities are planned which provide for intellectual stimulation and language development, promote a positive self-concept, promote curiosity and creativity, foster health and physical development, promote social competence, and help young children establish self-discipline and self-control (Weikart, 1986).

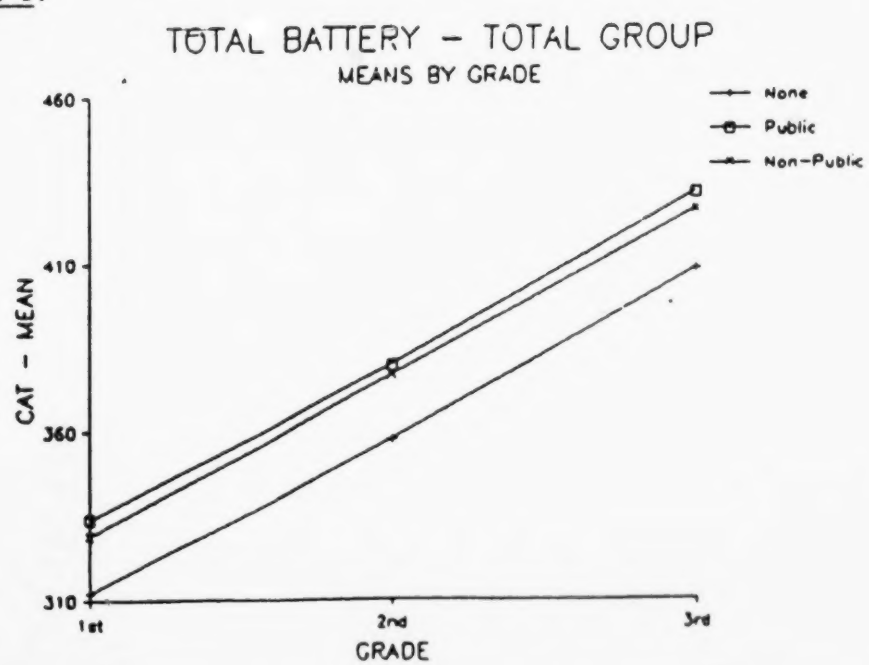
Table 3

Total Battery--Total Group Preschool Effect

	Grade 1			Grade 2			Grade 3		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Group 1	134	311.87	29.23	134	357.81	36.04	134	407.82	48.23
Group 2	136	333.77	35.19	136	379.59	43.02	136	431.28	52.46
Group 3	185	328.77	33.43	185	376.52	43.05	185	426.11	51.60
		1 3 2			1 3 2			1 3 2	

Underscored pairs were not significantly different.

Figure 1.



Throughout this study, no causal relationship has been inferred nor can be inferred that the test score differences among the three groups of students were caused by kindergarten attendance. Extreme caution must be exercised in drawing such an inference because two hypotheses could account for the differences in test scores.

One hypothesis could be that the test score differences were the effects of gains in cognitive development that resulted from kindergarten experiences. Another hypothesis could be that the test score differences were the effects of socioeconomic status. That is, that the parents who placed their children in kindergarten were of higher socioeconomic status and already provided their children with nurturance, encouragement, and an educational environment at home.

Evidence that was available to this study was insufficient to establish the validity of either hypothesis. Variables such as socioeconomic status could not be controlled. However, when examining the results of this study and reviewing the results of similar research reports, it is probable that the significant differences are, in part, explainable by both hypotheses (Braggett, 1975; Cowles & Daniels, 1978; Schweinhart & Barnett, 1984).

Another interesting finding of this study was that the sex effect, included as a control variable, when analyzed using the

MANOVA statistic, yielded no systematic significant differences between the performance of males and females. The same finding was reported by Cowles and Daniels (1978). The implication being that kindergarten attendance can be influential on future school success for females and males.

The major outstanding finding in this study was that the differences among the three groups of students on achievement scores were significant across all grade levels (Table 3). The Westinghouse Report (1969) and other studies (Brown, 1978) of the late 1960s reported that any significant findings at the first grade level due to kindergarten attendance faded by the conclusion of the third grade. Consistent with other studies (Lazar & Darlington, 1979; Schweinhart & Weikart, 1980), significant differences among the three groups of students continued through the third grade. In the majority of the subtests, the differences among the three groups were increasing at the third grade level rather than diminishing (Figure 1).

In conclusion, this study found that the students who attended kindergarten scored significantly higher on the California Achievement Test through the third grade than the students who did not attend kindergarten prior to first grade. Even though no causal effect can be claimed for this finding, evidence supports the impact of kindergarten on later school success.

The students involved in the kindergarten programs in this

study were members of all socioeconomic status groups. Woodruff (1980) suggested that children from families of middle-to-higher-socioeconomic backgrounds bring with them to school an advantage in language and reading that might make the preschool experience less influential on their later achievement. Bloom (1981) wrote that all children, disadvantaged or not, are under stimulated and should be able to gain from a preschool environment that has been structured to meet individual needs. Research by Lazar and Darlington (1979), Schweinhart and Weikart (1980), and Cowles and Daniels (1978) has led to the conclusion that life successes for disadvantaged children are positively influenced by a good preschool experience. This study finds that the kindergarten experience can be beneficial to heterogeneous groups of children at least through the third grade of elementary school.

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